Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-3: CANCELED

4. (currently amended) ~~The hearing amplification device of claim 3~~ In a hearing amplification device adapted to receive a sound signal, the hearing amplification device having at least one bandpass non-linearity (BPNL) channel configured to receive an input representative of said sound signal, the improvement comprising:

said channel being further configured with a memoryless nonlinear amplifier to provide (1) linear gain for an input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, (2) instantaneous compressive gain for an input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain, and (3) control of said compression threshold that is adaptive at least partially in response to changes in said sound signal, and

wherein said at least one channel is configured to have its compression threshold initially set to a predetermined quiescent level, and wherein said at least one channel is further configured to adjust said compression threshold such that said compression threshold is in a range of about said predetermined quiescent level to about 20 decibels below an average sound level of at least a portion of said sound signal.

5. (currently amended) ~~The hearing amplification device of claim 3~~ In a hearing amplification device adapted to receive a sound signal, the hearing amplification device having

at least one bandpass non-linearity (BPNL) channel configured to receive an input representative of said sound signal, the improvement comprising:

said channel being further configured with a memoryless nonlinear amplifier to provide (1) linear gain for an input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, (2) instantaneous compressive gain for an input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain, and (3) control of said compression threshold that is adaptive at least partially in response to changes in said sound signal, and

wherein said at least one channel is configured to adjust said compression threshold such that said compression threshold is within a range of about 5 decibels below an average sound level of at least a portion of said sound signal to about 5 decibels above said average sound level.

6. (currently amended) The hearing amplification device of claim ~~3~~ 4 wherein said at least one channel is further configured to provide a smooth transition between said linear gain and said instantaneous compressive gain.

7. (currently amended) The hearing amplification device of claim ~~3~~ 4 wherein said at least one channel is further configured to provide a sharp transition between said linear gain and said instantaneous compressive gain.

8. (currently amended) The hearing amplification device of claim ~~3~~ 4 wherein said at least one channel is further configured to provide (1) decompression for an input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than a decompression threshold, said decompression threshold being greater than said compression threshold.

9. (original) The hearing amplification device of claim 8 wherein said at least one channel is configured to have its compression threshold initially set to a predetermined quiescent level, and wherein said at least one channel is further configured to adjust said compression threshold such that said compression threshold is in a range of about said predetermined quiescent level to about said decompression threshold.

10. (previously presented) The hearing amplification device of claim 8 wherein said at least one channel is further configured to provide attenuation for an input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than an attenuation threshold, said attenuation threshold being greater than said decompression threshold.

11. (original) The hearing amplification device of claim 2 wherein said at least one channel is further configured to provide said instantaneous compressive gain as at least square root compression.

12. (original) The hearing amplification device of claim 2 wherein said at least one channel is further configured to adjust said compression threshold at least partially in response to a user input.

13. (original) The hearing amplification device of claim 2 having a plurality of said channels, each of said channels being responsive to an input representative of an audio frequency range different from other channels.

14. (original) The hearing amplification device of claim 13 wherein each channel is configured to have its compression threshold initially set independently of each other channel, and wherein each channel is further configured to adjust its compression threshold at least partially in response to changes in said sound signal.

15. (original) The hearing amplification device of claim 14 wherein each channel is configured to independently adjust its compression threshold at least partially in response to changes in said sound signal.

16. (previously presented) The hearing amplification device of claim 14 wherein each channel is further configured to provide (1) decompression for an input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than a decompression threshold, said decompression threshold being greater than said compression threshold.

17. (currently amended) ~~The hearing amplification device of claim 16~~ In a hearing amplification device adapted to receive a sound signal, the hearing amplification device having at least one bandpass non-linearity (BPNL) channel configured to receive an input representative of said sound signal, the improvement comprising:

a plurality of channels, each of said channels being responsive to an input representative of an audio frequency range different from other channels, each channel being further configured with a memoryless nonlinear amplifier to provide (1) linear gain for an input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, (2) instantaneous compressive gain for an input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain, and (3) adaptive control of said compression threshold;

wherein each channel is further configured to have its compression threshold initially set independently of each other channel;

wherein each channel is further configured to adjust its compression threshold at least partially in response to changes in said sound signal;

wherein each channel is further configured to provide (1) decompression for an input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than a decompression threshold, said decompression threshold being greater than said compression threshold; and

wherein each channel is further configured to (1) have its compression threshold initially set to a predetermined quiescent level, and ~~wherein each channel is further configured to~~ (2) adjust its compression threshold such that its compression threshold is in a range of about its predetermined quiescent level to about said decompression threshold.

18. (original) The hearing amplification device of claim 17 wherein each channel is further configured to adjust its compression threshold such that its compression threshold is in a range of about said predetermined quiescent level to about 20 decibels below an average sound level of at least a portion of said sound signal.

19. (original) The hearing amplification device of claim 17 wherein each channel is configured to adjust its compression threshold such that its compression threshold is within a range of about 5 decibels below an average sound level of at least a portion of said sound signal to about 5 decibels above said average sound level.

Claims 20-21: CANCELED

22. (currently amended) ~~The method of claim 21 further comprising~~ A method of compensating for impaired hearing, said method comprising:

linearly amplifying an input corresponding to a portion of a subband of a sound signal having an instantaneous sound level less than a compression threshold;

instantaneously compressively amplifying an input corresponding to a portion of a subband of a sound signal having an instantaneous sound level greater than said compression threshold;

initially setting said compression threshold at a predetermined quiescent level;

storing a previously determined peak value for a previous portion of said sound signal;

determining a current peak value for a current portion of said sound signal; and

adaptively controlling said compression threshold at least partially in response to changes in said sound signal; and

wherein said adaptively controlling step includes increasing said compression threshold when said determined current peak value is greater than said stored peak value.

23. (original) The method of claim 22 wherein said adaptively controlling step includes:

maintaining said compression threshold at its current level when said determined current peak value does not deviate by more than a predetermined triggering amount from said stored peak value; and

decreasing said compression threshold when said determined current peak value deviates by more than said predetermined triggering amount from said stored peak value.

24. (original) The method of claim 23 wherein said decreasing step includes:

decreasing said compression threshold when said determined current peak value has continuously deviated by more than said predetermined triggering amount from said stored peak value for a predetermined amount of time.

25. (previously presented) The method of claim 24 wherein said adaptively controlling step further includes:

setting a maximum value for said compression threshold;

setting a minimum value for said compression threshold;

estimating an average sound level for at least a portion of said sound signal from said determined current peak value;

wherein said increasing step includes increasing said compression threshold to substantially match said estimated average sound level when said estimated average sound level is less than or equal to said maximum value and increasing said compression threshold to equal said maximum value when said estimated average sound level is greater than said maximum value; and

wherein said decreasing step includes decreasing said compression threshold by a fixed amount when said compression threshold minus said fixed amount would not be less than said minimum value and decreasing said compression threshold to equal said minimum value when said compression threshold minus said fixed amount would be less than said minimum value.

26. (previously presented) The method of claim 25 further comprising:

providing decompression for an input corresponding to a portion of a subband of a sound signal having an instantaneous sound level greater than said decompression threshold, wherein said decompression threshold is greater than said compression threshold.

27. (original) The method of claim 26 wherein said step of setting said maximum value includes setting said maximum value as said decompression threshold, and wherein said step of setting said minimum value includes setting said minimum value as said predetermined quiescent level.

28. (currently amended) The method of claim ~~21~~ 22 further comprising:

providing decompression for an input corresponding to a portion of a subband of a sound signal having an instantaneous sound level greater than said decompression threshold, wherein said decompression threshold is greater than said compression threshold.

29. (previously presented) The method of claim 28 further comprising:

attenuating an input corresponding to a portion of a subband of a sound signal having an instantaneous sound level greater than an attenuation threshold, wherein said attenuation threshold is greater than said decompression threshold.

30. (currently amended) The method of claim ~~21~~ 22 further comprising:
performing each of said steps for a plurality of different audio frequency ranges.

Claims 31-33: CANCELED

34. (currently amended) The device of claim ~~35~~ 36 wherein said transfer function is configured to obey odd symmetry.

35. CANCELED

36. (currently amended) ~~The device of claim 35~~ A bandpass non-linearity (BPNL) hearing amplification device adapted to receive and amplify a sound signal, said device comprising:
a memoryless transducer for processing a transducer input according to a transfer function to thereby produce a transducer output, said transducer input being representative of a subband of a sound signal, said transducer output being representative of an amplified sound signal, said transfer function being configured to provide (1) linear gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, and (2) instantaneous compressive gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain, wherein said compression threshold is initially set to a predetermined quiescent level; and

a compression threshold controller coupled to said transducer for adjusting said compression threshold at least partially in response to changes in said sound signal, and wherein said controller is configured to:

estimate an average sound level for at least a portion in time of said sound signal; and

adjust said compression threshold in a range of about said predetermined quiescent level to about 20 decibels below said estimated average sound level.

37. (currently amended) ~~The device of claim 35~~ A bandpass non-linearity (BPNL) hearing amplification device adapted to receive and amplify a sound signal, said device comprising:

a memoryless transducer for processing a transducer input according to a transfer function to thereby produce a transducer output, said transducer input being representative of a subband of a sound signal, said transducer output being representative of an amplified sound signal, said transfer function being configured to provide (1) linear gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, and (2) instantaneous compressive gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain; and

a compression threshold controller coupled to said transducer for adjusting said compression threshold at least partially in response to changes in said sound signal, and wherein said controller is configured to:

estimate an average sound level for at least a portion in time of said sound signal; and

adjust said compression threshold in a range of about 5 decibels below said estimated average sound level to about 5 decibels above said estimated average sound level.

38. (currently amended) The device of claim ~~35~~ 36 wherein said transfer function is further configured to provide a smooth transition between said linear gain and said instantaneous compressive gain.

39. (currently amended) The device of claim ~~35~~ 36 wherein said transfer function is further configured to provide a sharp transition between said linear gain and said instantaneous compressive gain.

40. (currently amended) ~~The device of claim 35~~ A bandpass non-linearity (BPNL) hearing amplification device adapted to receive and amplify a sound signal, said device comprising:

a memoryless transducer for processing a transducer input according to a transfer function to thereby produce a transducer output, said transducer input being representative of a subband of a sound signal, said transducer output being representative of an amplified sound signal, said transfer function being configured to provide (1) linear gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, and (2) instantaneous compressive gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain; and

a compression threshold controller coupled to said transducer for adjusting said compression threshold at least partially in response to changes in said sound signal; and

wherein an asymptotic representation of said transfer function TA1 is defined by the general formula:

$$TA=TA(u,A,U,p),$$

wherein for $|u| < U$:

$$TA(u,A,U,p)=Au$$

wherein for $|u| > U$

$$TA(u,A,U,p)=\mathrm{sgn}(u)AU\left|\frac{u}{U}\right|^{p}$$

wherein:

$$TA1 = TA1(u,U_C) = TA(u,A(U_C),U_C(Y),p);$$

wherein $U_C(Y) = U_1$ for Y less than U_1 and $U_C(Y) = Y$ for Y greater than or equal to U_1, wherein U_1 represents a quiescent level for said compression threshold, wherein U_C represents an adjusted compression threshold, wherein Y represents a control signal from said controller for controlling said compression threshold, wherein u represents said transducer input, wherein p represents a compression power, and wherein A represents a magnitude of gain, wherein for Y less than U_1:

$$A = G_1$$

and wherein for Y greater than or equal to U_1:

$$A = G_1 \left| \frac{U_1}{U_C} \right|^{1-p}$$

wherein G_1 represents the magnitude of a quiescent gain.

41. (currently amended) The device of claim ~~35~~ 36 wherein said transfer function is further configured to provide decompression for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than a decompression threshold, wherein said decompression threshold is greater than said compression threshold.

42. (currently amended) ~~The device of claim 41~~ A bandpass non-linearity (BPNL) hearing amplification device adapted to receive and amplify a sound signal, said device comprising:

a memoryless transducer for processing a transducer input according to a transfer function to thereby produce a transducer output, said transducer input being representative of a subband of a sound signal, said transducer output being representative of an amplified sound signal, said transfer function being configured to provide (1) linear gain for a transducer input

representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, and (2) instantaneous compressive gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain; and

a compression threshold controller coupled to said transducer for adjusting said compression threshold at least partially in response to changes in said sound signal;

wherein said transfer function is further configured to provide decompression for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than a decompression threshold, wherein said decompression threshold is greater than said compression threshold; and

wherein an asymptotic representation of said transfer function is defined as a cascade of two functions TA1 and TA2, wherein both TA1 and TA2 are defined the general formula:

$$TA=TA(u,A,U,p),$$

wherein for $|u| < U$:

$$TA(u,A,U,p)=Au$$

wherein for $|u| > U$

$$TA(u,A,U,p)=\mathrm{sgn}(u)AU\left|\frac{u}{U}\right|^{p}$$

wherein:

$$TA1=TA1(u,U_C)=TA(u,A(U_C),U_C(Y),p);$$

wherein $U_C(Y)= U_1$ for Y less than U_1, $U_C(Y) = Y$ for Y greater than or equal to U_1 and less than or equal to U_2, and $U_C(Y)=U_2$ for Y greater than U_2, wherein U_1 represents a quiescent level for said compression threshold, wherein U_2 represents said decompression threshold, wherein U_C represents an adjusted compression threshold, wherein Y represents a control signal from said controller for controlling said compression threshold, wherein u represents

said transducer input, wherein p represents a compression power, and wherein A represents a magnitude of gain, wherein for Y less than U_1:

$$A = G_1$$

and wherein for Y greater than or equal to U_1:

$$A = G_1 \left| \frac{U_1}{U_C} \right|^{1-p}$$

wherein G_1 represents the magnitude of a quiescent gain; and

wherein for TA2=TA2(u)=TA(u,1,U_2,p_2), wherein u represents TA1, wherein U_2 represents said decompression threshold, and wherein $1 \leq p_2 \leq 1/p$.

43. (previously presented) The device of claim 41 wherein said transfer function is further configured to provide attenuation for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than an attenuation threshold, wherein said attenuation threshold is greater than said decompression threshold.

44. (currently amended) ~~The device of claim 43~~ A bandpass non-linearity (BPNL) hearing amplification device adapted to receive and amplify a sound signal, said device comprising:

a memoryless transducer for processing a transducer input according to a transfer function to thereby produce a transducer output, said transducer input being representative of a subband of a sound signal, said transducer output being representative of an amplified sound signal, said transfer function being configured to provide (1) linear gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, and (2) instantaneous compressive gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain; and

a compression threshold controller coupled to said transducer for adjusting said compression threshold at least partially in response to changes in said sound signal;

wherein said transfer function is further configured to provide decompression for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than a decompression threshold, wherein said decompression threshold is greater than said compression threshold;

wherein said transfer function is further configured to provide attenuation for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than an attenuation threshold, wherein said attenuation threshold is greater than said decompression threshold; and

wherein an asymptotic representation of said transfer function is defined as a cascade of three functions TA1, TA2, and TA3, wherein TA1 , TA2, and TA3 are each defined by the general formula:

$$TA=TA(u,A,U,p),$$

wherein for $|u| < U$:

$$TA(u,A,U,p)=Au$$

wherein for $|u| > U$

$$TA(u,A,U,p)=\mathrm{sgn}(u)AU\left|\frac{u}{U}\right|^{p}$$

wherein:

$$TA1=TA1(u,U_C)=TA(u,A(U_C),U_C(Y),p_4);$$

wherein $U_C(Y)= U_1$ for Y less than U_1, $U_C(Y) = Y$ for Y greater than or equal to U_1 and less than or equal to U_2, and $U_C(Y)=U_2$ for Y greater than U_2, wherein U_1 represents a quiescent level for said compression threshold, wherein U_2 represents said decompression threshold, wherein U_C represents an adjusted compression threshold, wherein Y represents a control signal from said controller for controlling said compression threshold, wherein u represents

said transducer input, wherein p_1 represents a first compression power, and wherein A represents a magnitude of gain, wherein for Y less than U_1:

$$A = G_1$$

and wherein for Y greater than or equal to U_1:

$$A = G_1 \left| \frac{U_1}{U_C} \right|^{1-p}$$

wherein G_1 represents the magnitude of a quiescent gain;

wherein for TA2=TA2(u)=TA(u,1,U_2,p_2), wherein u represents TA1 or TA3, wherein U_2 represents said decompression threshold, and wherein $1 \leq p_2 \leq 1/p_1$ and

wherein for TA3=TA3(u)=TA(u,1,U_3,p_3), u represents TA1 or TA2, wherein U_3 represents said attenuation threshold, and wherein p_3 represents a second compression power.

45. (currently amended) The device of claim ~~35~~ 36 further comprising a plurality of said transducers and a plurality of channels, each channel being responsive to a different predetermined channel frequency range and comprising one of said transducers, and wherein said controller is coupled to each of said transducers, wherein said transducer input for each transducer is representative of those frequency components of said sound signal that are within its corresponding predetermined channel frequency range.

46. (previously presented) The device of claim 45 wherein each of said channels and said controller are implemented in a digital signal processor, each transducer input being a digital representation of said subband sound signal.

47. (original) The device of claim 46 wherein said digital signal processor is a multirate digital signal processor.

48. (original) The device of claim 45 wherein each of said channels and said controller are implemented in a plurality of analog components.

49. (currently amended) The device of claim ~~35~~ 36 wherein said transducer and said controller are implemented in a digital signal processor, said transducer input being a digital representation of said subband sound signal.

50. (original) The device of claim 49 wherein said digital signal processor is a multirate digital signal processor.

51. (currently amended) The device of claim ~~35~~ 36 wherein said transducer and said controller are implemented in a plurality of analog components.

52. (currently amended) ~~The device of claim 35~~ A bandpass non-linearity (BPNL) hearing amplification device adapted to receive and amplify a sound signal, said device comprising:

a memoryless transducer for processing a transducer input according to a transfer function to thereby produce a transducer output, said transducer input being representative of a subband of a sound signal, said transducer output being representative of an amplified sound signal, said transfer function being configured to provide (1) linear gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level less than a compression threshold, and (2) instantaneous compressive gain for a transducer input representative of a portion of a subband of said sound signal having an instantaneous sound level greater than said compression threshold, wherein said instantaneous compressive gain is less than said linear gain; and

a compression threshold controller coupled to said transducer for adjusting said compression threshold at least partially in response to changes in said sound signal, wherein said controller is configured with:

a first operating mode in which said controller is configured to not adjust said compression threshold; and

a second operating mode in which said controller is configured to adjust said compression threshold at least partially in response to changes in said sound signal; and

wherein said controller is switchable between said first operating mode and said second operating mode.

53. (original) The device of claim 52 wherein said controller is further configured with:

a third operating mode in which said controller is configured to fix said compression threshold at a current level;

wherein said controller is switchable between said first operating mode, said second operating mode, and said third operating mode.

54. (original) The device of claim 53 wherein said controller is configured to switch between said first operating mode, said second operating mode, and said third operating mode at least partially in response to a user input.

Claims 55-58: CANCELED

59. (original) A method of diagnosing an extent and form of hearing impairment, said method comprising:

determining an amount of low level gain G_1 needed by a patient in a plurality of different audio frequency ranges for sound signals having a low sound level;

selecting a compression power p;

adjusting a hearing amplifier device having a plurality of channels corresponding said audio frequency ranges to provide the determined low level gain G_1 for each channel and selected compression power p, said hearing amplification device being configured to process an input signal representative of a sound signal according to a merging family of channel

transducer characteristics to create an amplified signal, said characteristics defined by (1) linear gain for input signals representative of a sound signal having a sound level less than a compression threshold, (2) rapid compressive gain for input signals representative of a sound signal having a sound level greater than a compression threshold;

presenting a sound signal at an input of the hearing amplification device to generate an amplified signal therefrom;

providing to the patient the amplified signal generated from said presented sound signal; and

adjusting the values of said compression threshold for low level gain G_1 for each channel and said compression power p until the patient communicates that he/she has perceived satisfactory results.

Claims 60-65: CANCELED

66. (previously presented) The method of claim 59 wherein said rapid compressive gain is instantaneous compressive gain.

Claims 67-74: CANCELED

75. (new) A hearing aid device providing instantaneous gain compression for sound signals and adaptive control of nonlinear waveform distortion, the device comprising:

at least one bandpass nonlinearity (BPNL) amplifier comprising a first bandpass filter, a second bandpass filter, and a memoryless nonlinear (MNL) compressive audio amplifier configured to receive a sound signal from the first bandpass filter and provide an MNL compressive audio amplifier output to the second bandpass filter, wherein the MNL compressive audio amplifier is configured to produce the MNL compressive audio amplifier output by providing memoryless gain compression directly on a sound signal that is (1) received from the first bandpass filter and (2) exhibits instantaneous amplitudes greater than a

compression threshold, the BPNL amplifier thereby producing a desired gain compression on the received sound signal at an output of the second bandpass filter; and

a controller in communication with the at least one BPNL amplifier, the controller being configured to adjust the compression threshold of the MNL compressive audio amplifier.

76. (new) The device of claim 75 wherein the controller is further configured to adjust the compression threshold from a quiescent compression threshold at least partially in response to changes in the received sound signal.

77. (new) The device of claim 76 wherein the controller is further configured to adjust the compression threshold from the quiescent compression threshold at least partially in response to changes in an estimate of a RMS value for the received sound signal.

78. (new) The device of claim 76 wherein the controller is further configured to control waveform distortion caused by the MNL compressive audio amplifier by adjusting the compression threshold from the quiescent compression threshold at least partially in response to changes in the received sound signal.

79. (new) The device of claim 76 wherein the MNL compressive audio amplifier is further configured to provide BPNL gain compression for a tone within its passband via an MNL transducer input/output (I/O) function that is in close approximation to a desired RMS I/O function.

80. (new) The device of claim 79 wherein the transducer function is configured as an odd symmetric function $f(u) = -f(-u)$, wherein u is a sample value of the sound signal processed by the MNL compressive audio amplifier.

81. (new) The device of claim 79 wherein the transducer function is further configured to provide a constant gain for received sound amplitudes below the compression threshold, wherein the compressive gain is less than the constant gain.

82. (new) The device of claim 81 wherein the transducer function is further configured to provide decompression for received sound amplitudes greater than a decompression threshold, the decompression threshold being greater than the compression threshold.

83. (new) The device of claim 81 wherein the controller is further configured to adjust the compression threshold to a value within a range between the quiescent compression threshold and the decompression threshold.

84. (new) The device of claim 83 further comprising a plurality of the BPNL amplifiers, each BPNL amplifier being configured to process a different frequency subband of a broadband sound signal.

85. (new) The device of claim 84 wherein the controller is further configured to adjust the compression threshold for each subband to a value within the range between the quiescent compression threshold and the decompression threshold at least partially in response to an estimate of a short-term RMS amplitude for the broadband sound signal.

86. (new) The device of claim 83 wherein the transducer function is further configured to provide protective attenuation for received sound amplitudes greater than an attenuation threshold, the attenuation threshold being greater than the decompression threshold.

87. (new) The device of claim 76 wherein the controller is further configured to upwardly adjust the compression threshold if the received sound signal exhibits an estimated RMS amplitude greater than a specified amount.

88. (new) The device of claim 87 wherein the controller is further configured to downwardly adjust the compression threshold if the received sound signal exhibits an estimated RMS amplitude below a triggering amount for a duration of time greater than a predetermined release time.

89. (new) The device of claim 88 wherein the triggering amount is derived from a fraction of an estimated RMS amplitude for a most recently received sound signal that caused an upward adjustment of the compression threshold.

90. (new) The device of claim 88 wherein the controller is further configured to maintain the compression threshold and the triggering amount at its current levels if the received sound signal does not maintain an estimated short-term RMS amplitude below the triggering amount throughout the release time duration.

91. (new) The device of claim 75 further comprising a plurality of the BPNL amplifiers, each BPNL amplifier being configured to process a different frequency subband of a broadband sound signal.

92. (new) The device of claim 91 wherein the controller is further configured to coordinate adjustment of the compression thresholds for each BPNL amplifier to produce a desired nonlinear waveform quality.

93. (new) The device of claim 75 wherein the controller is further configured to fix the compression threshold at a current level in response to user input.

94. (new) The device of claim 75 wherein the controller is further configured to adjust the compression threshold between at least (1) a first level associated with a quiet environment and (2) a second level associated with a noisy environment.

95. (new) The device of claim 94 wherein the controller is further configured to adjust the compression threshold between the at least first and second levels at least partially in response to changes in the received sound signal.

96. (new) The device of claim 94 wherein the controller is further configured to adjust the compression threshold between the at least first and second levels at least partially in response to user input.

97. (new) The device of claim 75 wherein the at least one BPNL amplifier is a digital BPNL amplifier.

98. (new) The device of claim 75 wherein the at least one BPNL amplifier is an analog BPNL amplifier.